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MAINE DEPARTMENT OF MARINE RESOURCES

2004 MODIFIED GROUNDLINE PROJECT

Final Report to the National Marine Fisheries Service

September 16, 2004

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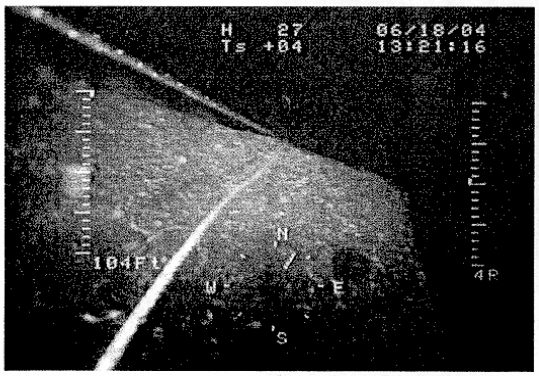

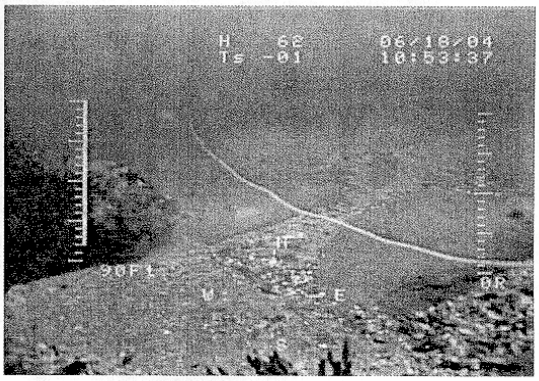

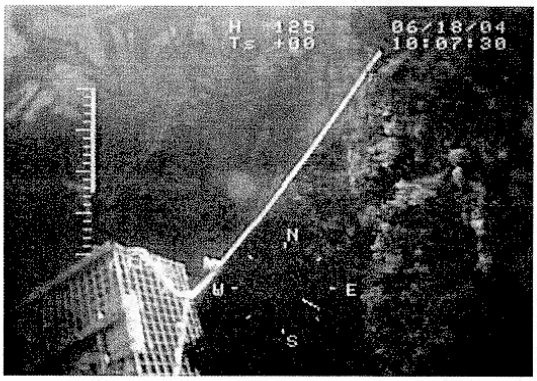

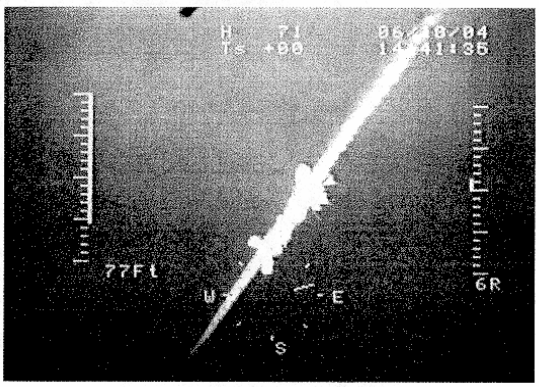

Maine Department of Marine Resources
PO Box 8
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MAINE DMR MODIFIED GROUNDLINE PROJECT
(Part of the Maine Recovery Plan)

FINAL REPORT TO NOAA FISHERIES
September 16, 2004

Project Goal

In response to the risk reduction criteria identified by the ALWTRT, Maine Department of Marine Resources (DMR), in collaboration with NOAA Fisheries and the Maine lobster industry, will develop, field test and document groundline modifications that have the potential to sink and/or have a reduced groundline profile.

Project Summary

Ten fishermen were selected to participate in the project; three trawl fishermen from Western Maine and seven pairs fishermen from Mid-coast and Eastern Maine. DMR, NOAA Fisheries and the lobstermen met to discuss proposed modifications and determine the specific list of modified gear and alternate configurations to be tested. In early March 2004, the lobstermen were provided with traps, rope and a list of five experimental configurations. Some rigging decisions (groundline length, size and type of bridles, and the location where bridles were tied onto the trap) were left up to the lobstermen. The lobstermen were required to use logbooks to document every haul of the gear as well as their specific rigging details. All lobstermen began fishing the experimental gear by the end of April. Remote operated vehicle (ROV) filming began June 16 and continued for seven days. A total of 56 camera drops were made. Conditions occasionally made it impossible to film all five sets of each lobsterman, though the majority of gear was captured on film. From the film data, logbooks, and a follow-up survey, the performance of each configuration was assessed.

Background

The State of Maine is fully committed to the protection of the Atlantic Large Whales, while at the same time protecting the economic and operational realities of the State's fisheries. Toward this goal, DMR's effort to identify alternate gear modification options began in early 2003 with three pilot ROV surveys. Working off of commercial lobster boats with a contracted ROV camera operator, groundline profiles were observed in three disparate areas of Maine coastline. Comparing and contrasting the profiles of different

rope types was an awareness-building exercise for the industry members involved, and prompted several participants to develop and test a number of modified versions with the goal of reducing the vertical profile of the groundlines between traps. The pilot ROV survey underscored that while considering possible gear modification options, Maine's rocky and tidal coastal habitat presents a challenge in developing operationally workable solutions. To address this issue, in late 2003 DMR began a systematic ROV video survey of groundline gear along the Maine coast. The filming took 24 days and over 200 camera drops were made (see Map 2). The survey provided necessary background information on the underwater profile of commonly used ropes, and also helped define the gear and techniques that would be used in the 2004 modified groundline experiment.

Video footage from the 2003 surveys demonstrated the uniqueness of Maine's substrate and stimulated industry participation in experimenting with gear modifications. Sink rope was observed lying on or tightly stretched along the seafloor; "neutrally buoyant" rope was observed to behave in a similar manner to sink rope, but with looser contact on the substrate; and float rope was observed to be anywhere from stretched tightly along a rock ledge to arcing 35 feet from the seafloor. Summary footage from this ROV work was presented to project participants and industry members at Lobster Zone Council meetings and the Maine Fishermen's Forum.

Extreme rocky ledges, boulder fields and sheer walls as well as strong tides (which made retrieval of the ROV difficult at times) documented on film the operational need of Maine lobstermen for a groundline rope with the ability to stand up to a challenging environment. A number of industry members proposed ideas to the DMR, and some took the initiative to test out their ideas. This preamble led to the current project, field-testing five experimental groundline configurations.

Methodology

Lobstermen whose gear was filmed during the 2003 surveys were interested in testing modified gear, and continued discussions with these individuals yielded several different ideas for the experiment. DMR collaborated with NOAA Fisheries and several lobstermen to define the goals and methods of the project. The intent of the research was to investigate interactions between rope and the bottom-types encountered by lobstermen in areas where float rope has traditionally been used, as well as in areas of high risk for entanglements. Some of the rope used for testing was already well established as workable lobster gear in certain areas of the coast; while other rope was either newly developed or not regularly used by the lobstermen.

Experimental Ropes and Configurations

For the purposes of this summary, the word "tailer" is used to describe the rope connecting two traps in a pair of traps; the word "groundline" to describe the rope connecting multiple traps in a trawl; and "arc height" refers to the observed height (per ROV measurement) of the rope above the sea floor (zero).

Rope Type #1: Polysteel Atlantic Soft-lay Poly, a float rope, was chosen for testing based on footage observed from the fall 2003 ROV survey. While it is usually difficult to ascertain why a certain float rope might exhibit a lower profile than other types (whether due to the speed or manner in which the gear is set out, the tide direction at the set, the chemical composition or age of the rope, or the length of the groundline), this particular type of Polysteel was often observed during the earlier survey to yield a lower profile overall than that of other float ropes. This rope is commonly used by lobstermen in the eastern part of the State as a Canadian rope manufacturer supplies it.

Rope Type #2: Hy-Liner LoPro-1 was made specifically for this project by the Hy-Liner Rope Company in Thomaston, Maine, based on a promising modification generated by two mid-coast lobstermen (Myrick and Bramhall). They intertwined two strands of poly with one strand of sink rope, which, when filmed in November 2003, had a profile that was substantively lower (4' off bottom) than normal poly. Hy-Liner reproduced the properties of that rope modification into a new blend, referred to by the manufacturer as "LoPro-1". After manufacturing a pallet of this rope, the company's owner felt that it would be more buoyant than the sample, so he also provided *pro bono* a batch of "LoPro-2" -- denser rope with more polyester content -- which was distributed to 22 lobstermen for field-testing; some of it was filmed in this project.

Rope Type #3: Esterpro Hot-Shot sink rope was selected for testing because it is a heavy, durable line which would be challenged by the substrate in the rocky and tidal test areas. Pairs lobstermen in Eastern and Mid-coast Maine very rarely use sink rope on tailers, though some trawl lobstermen in the Western part of the State use it on groundlines.

Rope Type #4: Quintas & Quintas lead-core poly rope is a float rope with a lead core. This combination produces a rope that is heavy enough to stay on the bottom, and is more durable (due to its polypropylene content) than sink rope. Maine lobstermen do not commonly use it, in part because it is made by a Portuguese manufacturer and not readily available.

Rope Type #5: The custom configuration differed for pairs and trawl lobstermen. On the pairs, sink rope was to be spliced or tied into the middle of the existing poly tailer in a 1:3:1 ratio (e.g. 3 fathom poly: 9 fathom sink: 3 fathom poly for a 15 fathom tailer). Trawls were to be rigged with a length of sink rope, determined by the individual, spliced or tied into the existing poly groundline. Whether due to misinterpretation of the description or to an interest in testing a different modification, there were variations of both these configurations, including different ratios of sink to float, different positioning of each, and even the use of a full length of different line (Hy-Liner LoPro-2).

Rope-types used in Experimental Gear Project (All 3/8" diameter)	
Rope Name	Marketed as:
Polysteel Atlantic Soft-lay Poly	Float rope
Hy-Liner New Blend (LoPro-1)	Not sold
Esterpro Hot Shot	Sink rope
Quintas Lead-Core Poly	Sink rope
Custom (float-sink-float)	Various

Figure 1: Rope types used in experiment

Lobstermen participation

DMR and NOAA Fisheries identified participants from "problematic areas," i.e. lobstermen who fish in potential DAM action areas (western Maine) and lobstermen from Mid-coast and Downeast Maine who stated they couldn't fish without floating groundlines due to rocky and tidal conditions. Individual lobstermen were chosen based on their past involvement with Maine Recovery Plan efforts and their willingness to see this project through, including keeping a logbook.

Project lobstermen were selected from three focus areas: the Western coast - Casco Bay area; the Mid-coast - Muscongus Bay area; and the Downeast coast - Mount Desert Island area. Bottom types varied. (See Map 1 for areas represented in this survey.)

Participating lobstermen from each of the three areas provided their vessels as filming platforms, and all but one of the lobstermen was on the water with the film crew at some point during the filming. DMR staff was on board each day of filming.

Observations

During the fishing, filming, and film reviewing of this gear, observations were made of pairs and trawls and the differences between them. Though rope types were pre-determined, the length of the tailers and groundline was left up to the individual lobsterman. Consequently, there were variations in the arc heights of the poly. In this experiment tailer lengths were, on average, longer than groundline lengths – four pairs lobstermen used 15-fathom tailers, two used 10-fathom tailers and one used 6-fathom tailers; whereas two trawl lobstermen used 12-fathom groundlines and the third used 11 fathoms between traps. Observations (see Article 4 in the Appendix, Logbook Feedback) indicate that there are many variables that contribute to the height of rope above the sea floor, not just the rope type and length.

Lobstermen were requested to fish the experimental gear how and where they would normally fish during that time of year. The trawl gear in Casco Bay was fished in rocky areas that were covered with kelp, making visibility difficult when filming the sink rope groundlines. ROV footage depicted that even though the Casco Bay area bottom is not jagged or broken, there are issues with the rope chafing and gear hang downs.

The pairs gear in the Mid-coast and Downeast sections was fished on bottom that was considerably rockier than Casco Bay (see Table 3), and the tide or surge was visibly stronger during the filming. ROV filming of some gear was compromised due to tidal currents and a few pairs could not be filmed.

With Rope Types #1 and #2 (Polysteel and Hy-Liner LoPro-1), the arc height of the trawl groundlines was generally lower than that of pairs. This may be explained by the nature of a trawl to be tighter because of the increased weight of gear pulling along the same groundline as the gear falls to bottom. (See Table 4.)

Rope Type #1, Polysteel Atlantic soft-lay float rope, showed arc heights varying from four feet to 28 feet above bottom, and was generally lower in the trawls than in the pairs.

Rope Type #2, the Hy-Liner blend, gave generally lower arc heights than typcial poly. Occasionally, it had a profile similar to that of the Polysteel – particularly on the pairs that used longer (15 fathom) tailers. (See Tables 1 & 2.) On average, the arc height in trawls was slightly higher than the length of the gangions (all gangions were 6' long).

The two sink ropes – Rope Types #3 and #4, Esterpro and Quintas -- were observed squarely on the bottom in both pairs and trawls. (See Table 4.) However, the filming documented the rope chafing against the sea floor as it moved in the currents. The gear was hauled to observe and document the chafed areas. (Photos 1 & 2)

Photo 1: Esterpro HotShot sink rope, pairs rigged, showing chafed area

Photo 2: Quintas & Quintas lead-core poly, trawl-rigged, showing chafed area

Rope Type #5, the custom rigged combinations of poly-sink-poly, had arc heights that were relatively low – between zero and ten feet – but the one with 3/5 of poly in the middle of sink rope acted as though it were straight poly and gave a 27' arc. Chafing was observed where one type of rope met the other. (Photo 3) The Hy-Liner LoPro-2, used on one pair and one trawl as the custom rig, was observed in the trawl to have a profile similar to sink rope (laying on bottom) but with a looser aspect. (See Table 4.) Upon inspection, chafing was visible along the full length of the groundline. The lobsterman did not feel comfortable leaving that gear rigged with this rope configuration beyond the extent of this project for fear of gear loss. (As this rope is a prototype, further testing over a longer time period will be necessary to determine its longevity after such chafing.) The pair rigged with this line, off Mount Desert Is., was unable to be filmed due to tide in that area.

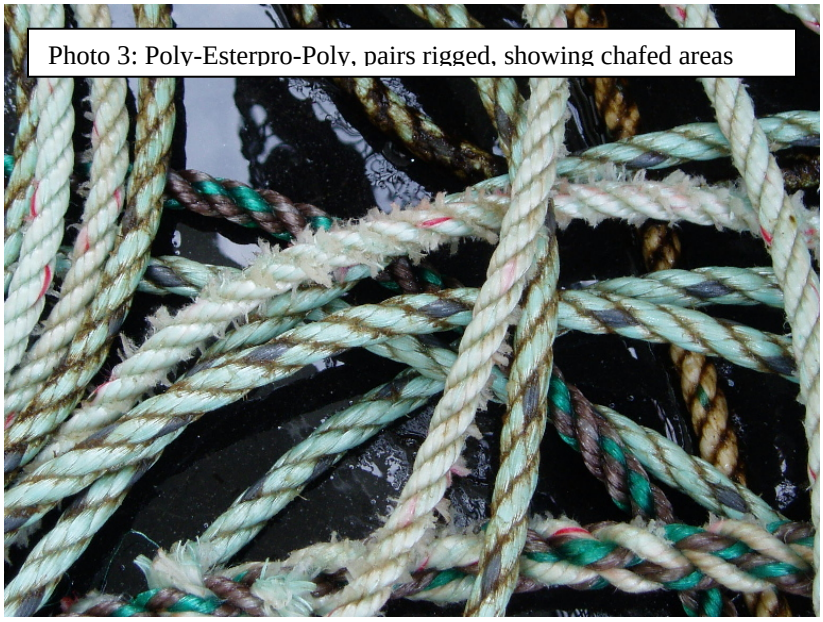


Photo 3: Poly-Esterpro-Poly, pairs rigged, showing chafed areas

Follow-up survey

A follow-up survey was mailed to each of the participants to document and assess the results of this experiment. Participants were asked to rank the ropes from 1-5, one being the rope type that worked best for them, five being the rope they liked least (Figure 2).

Pairs lobstermen preferred Polysteel float rope, with Hy-Liner LoPro-1 second. Both of these rope-types were observed to have higher arc heights than the other configurations. The two sink ropes and the custom combinations ranked much lower in preference, as they more consistently hung-down and exhibited significant chafing.

Trawl lobstermen preferred Polysteel float rope over all other types; however, sink ropes were preferred by trawl lobstermen over the Hy-Liner LoPro-1 and custom rigging, due to the tendency in the trawl configurations of the LoPro-1 and modified gear to come in periodic contact with the bottom and consequently chafe or hang down.

Average Rope Rankings

	Pairs	Trawls	Pairs and Trawls
Polysteel	1.166667	1.5	1.25
LoPro-1	1.666667	4.5	2.375
Esterpro	3.666667	3	3.5
Quintas	4.5	2	3.875
Custom	4.166667	4	4.125

Figure 2: Rope rankings

Pairs lobstermen reported the least number of hang-downs when using Polysteel or LoPro-1 (Figure 3). The most hang-downs occurred in the pairs when using the custom combination; one pairs lobsterman parted his gear off completely. Trawl lobstermen reported the most hang-downs with the LoPro-1, and reported no hang-downs with Polysteel rope.

Hang Downs

	Pairs	Trawls
Polysteel	3	0
LoPro-1	2	21
Esterpro	8	10
Quintas	15	11
Custom	19	6

Figure 3: Number of reported gear hang-downs

Chafing

	Pairs	Trawls
Polysteel	2	0
LoPro-1	3	3
Esterpro	5	3
Quintas	6	3
Custom	7	2

Figure 4: Number of participants who reported rope chafing

Chafing was reported for all but one rope type (Figure 4). Pairs lobstermen reported chafing on all ropes, but sinking rope was reported more often as having chafed, especially Quintas rope, which six of seven pairs lobstermen reported as chafing. Trawl lobstermen reported no chafing on Polysteel rope. All three trawl lobstermen saw chafing on the LoPro-1, Esterpro and Quintas rope.

Conclusion

Operationally, a rope with a great degree of strength and some amount of flotation is required for lobstermen working in areas of rocky and tidal habitat, or the gear will be compromised by chafing, hang downs, and parting. In other areas, a heavy, strong sink

rope is preferable to a rope that just hovers above the substrate. Sink rope may get hung down, but its strength may allow it to endure the chafing (e.g. Quintas lead-core poly).

Many of the gear modifications filmed as part of this experimental groundline project were observed to have arc heights of 10 feet or less. These experimental configurations can be compared to the relative extremes viewed in prior filming efforts (the observed maximum of 50 feet was reached on a pair of traps in Friendship, Maine and 30+ feet was not uncommon).

Chafing occurs wherever rope comes in contact with the bottom regardless of rope type, but even more so where one rope type meets another such as at the bridle, gangion or along a modified groundline. Inherent rope strength is critical to prevent gear loss.

Recommendations

As observed by the participating lobstermen and as viewed on film, shorter groundlines tend to yield lower arcs regardless of rope type. Further experimentation with groundline lengths is recommended to test operational feasibilities. Such experimentation would be useful particularly in Mid-coast and Downeast areas, where tailer lengths often run longer than 20 fathoms.

Further testing of sink rope on hard bottom needs to be carried out. The cursory testing performed during this survey indicated only that the gear did get hung down. No gear was parted off with the heavier sink rope, and it remained strong enough to be hauled back after it was hung down.

The Hy-Liner blend that was manufactured for use in this survey (LoPro-1) and the Hy-Liner LoPro-2 both need continued testing and assessment. Preliminary feedback from the 40+ lobstermen testing these two ropes since Spring 2004 is mixed (see Article 6, Hy-Liner New Blend Feedback Log). Reports of chafing and noisiness in the hauler are common, but many reports indicate operational viability. Because this rope is not commercially available and has no prior history of use, it should be monitored for at least a full season.

Lobstermen reported that traps rather than groundlines are frequently the cause of hang downs. Experimentation should be conducted with the placement, lengths and type of gangions and bridles on traps.

Given the extreme rocky and tidal habitat of Maine's Mid-coast and Downeast coastal waters and the historical distribution of Atlantic large whales, preliminary observations suggest that a groundline profile of 12' or less for pairs would be operationally feasible for industry and pose a low risk for entanglement to whales. It is critical to note that though ROV footage may depict the groundline or tailer at a certain height off bottom, the actual arc height may be very low relative to the rocky and jagged bottom it spans. There is very little flat or level bottom in the Downeast and Mid-coast survey areas, and tailers measured to be 20' or more often are only clearing the actual bottom by a matter of feet.

Trawl groundlines tend to have a lower profile than the same type and length of rope between pairs of traps. Traditional western Maine trawl-fishing areas also generally occur on bottom-types that are less challenging to sink rope (i.e. ledge, gravel, sand or mud). Sink rope or short float rope length requirements may provide viable, low-profile solutions.

Participants generally felt that the project tested ropes realistically, and that the selection of ropes for testing covered the range of available options. However, one comment repeated by many of the participating fishermen was that the spring months of March, April, May and June are not overly destructive with lobster gear. A true test of all these ropes and configurations would be in November and December when stronger, more sustained winds and storms tend to wreak havoc with the gear. A year long tracking would greatly assist in evaluating the operational viability of all experimental rope and configurations.

Appendix of Tables, Maps and Figures

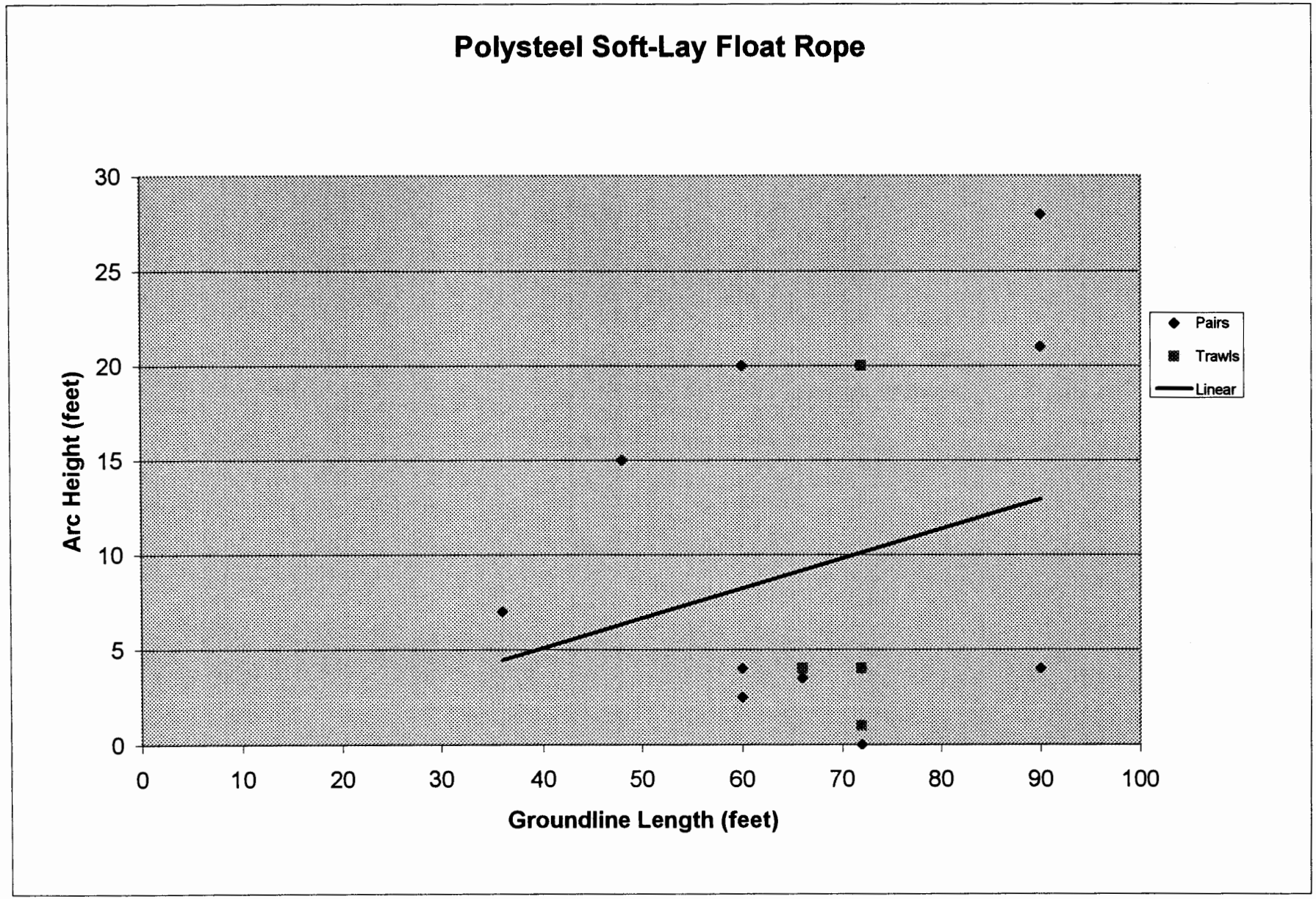

Polysteel Soft-Lay Float Rope
Arc Height (feet)
0
5
10
15
20
25
30
0
10
20
30
40
50
60
70
80
90
100
Groundline Length (feet)
Pairs
Trawls
Linear

Table 1

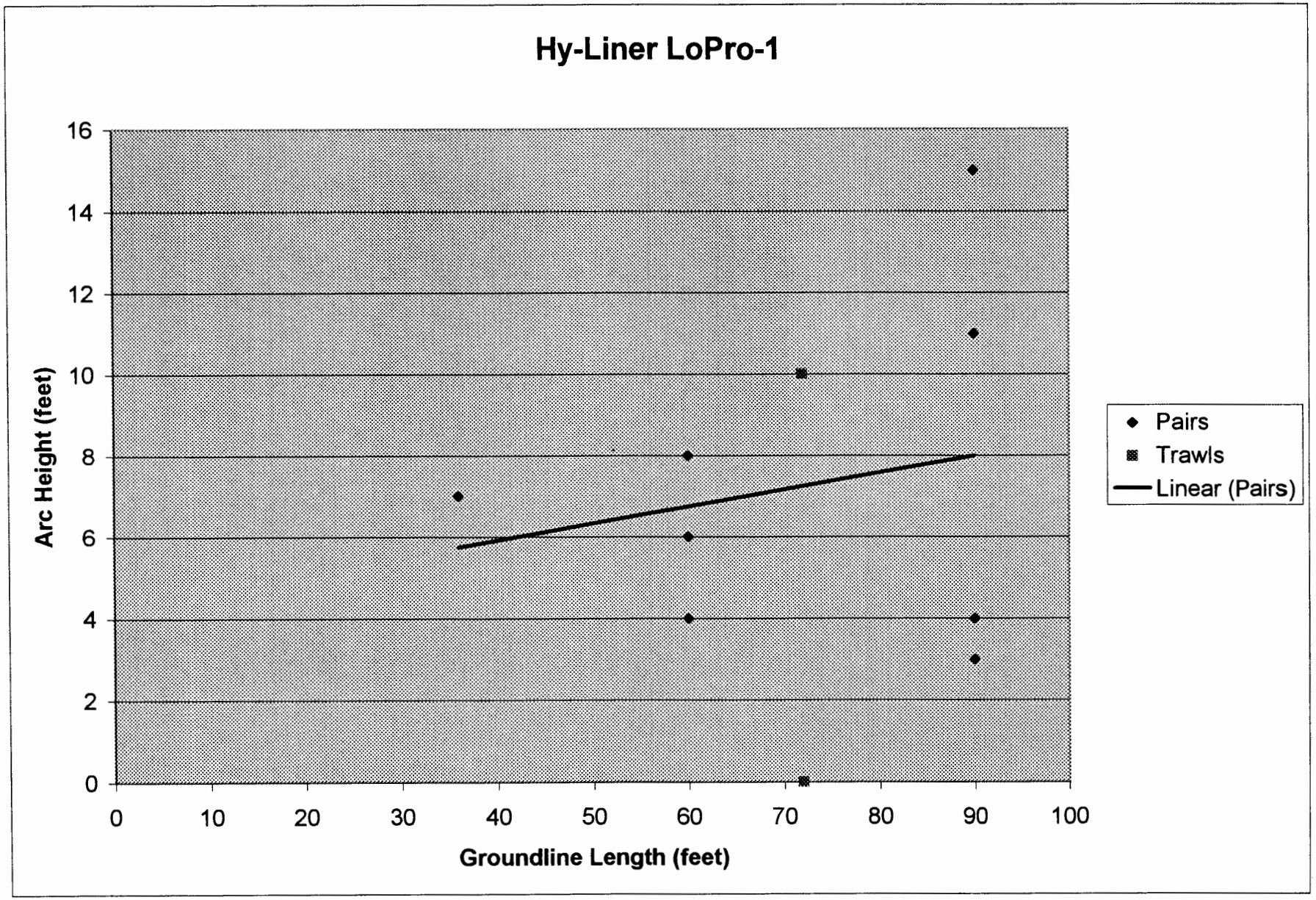

Hy-Liner LoPro-1
Arc Height (feet)
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
Groundline Length (feet)
Pairs
Trawls
Linear (Pairs)

Table 2

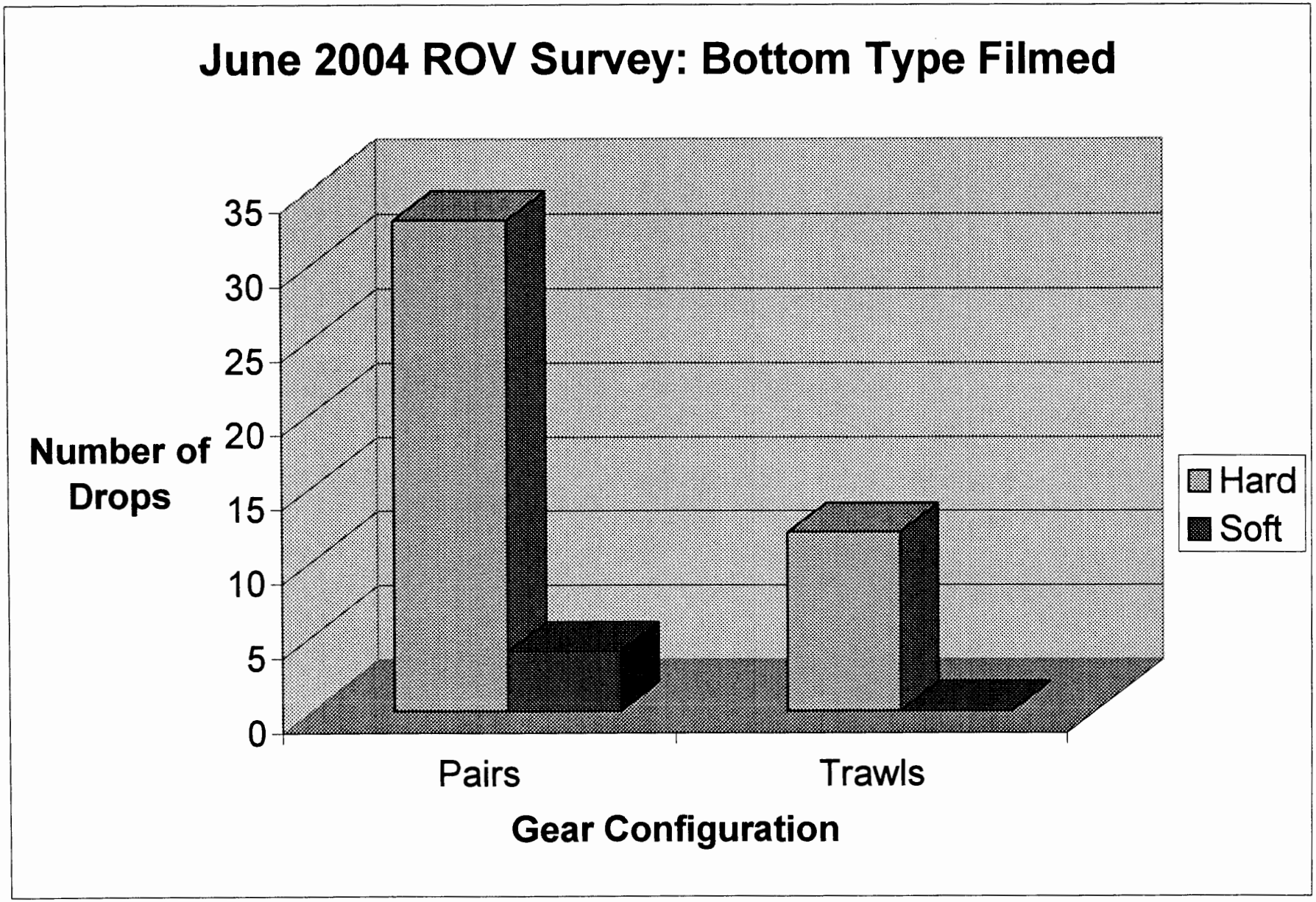

June 2004 ROV Survey: Bottom Type Filmed
Number of Drops
35
30
25
20
15
10
5
0
Pairs
Trawls
Gear Configuration
Hard
Soft

Table 3

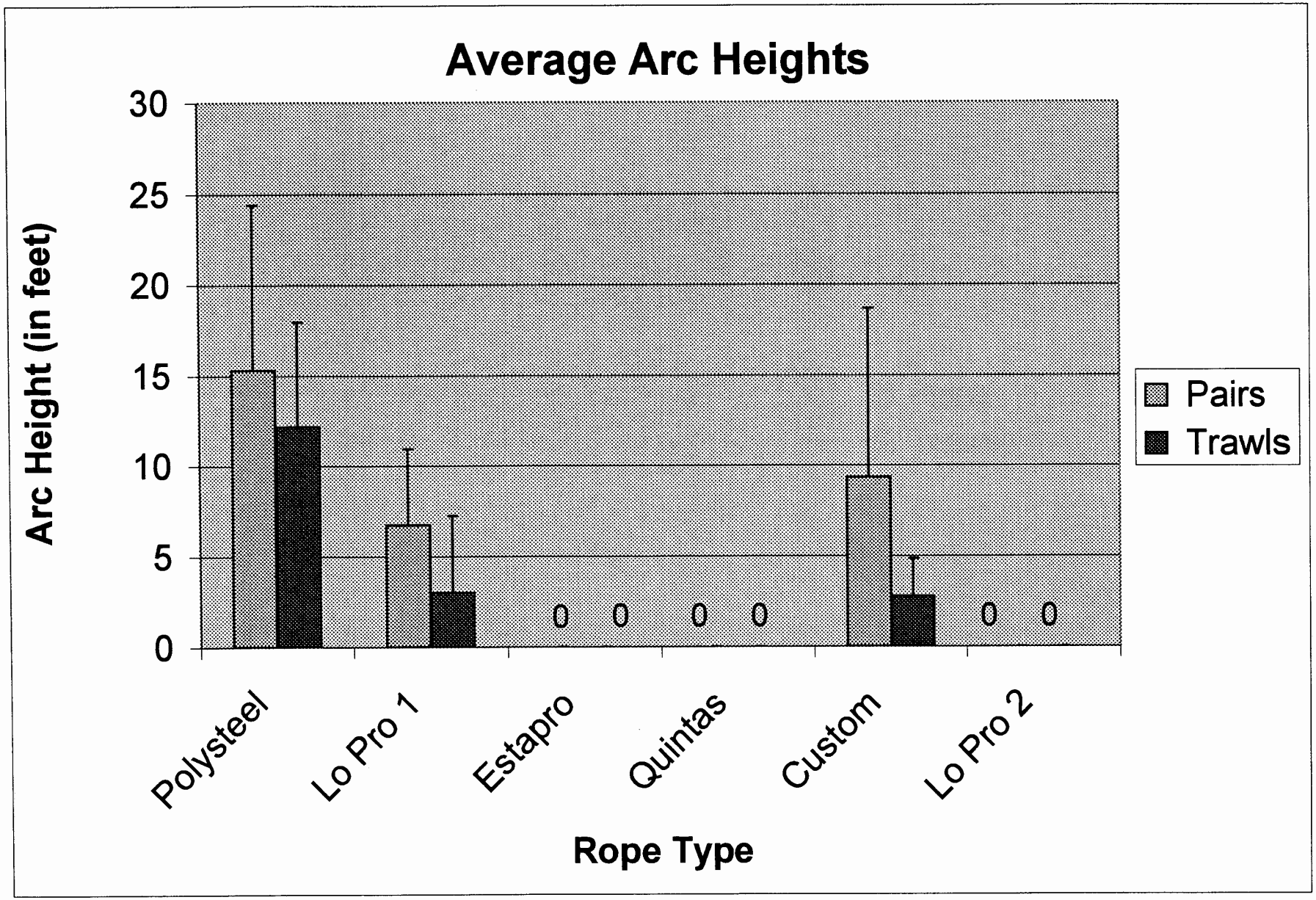
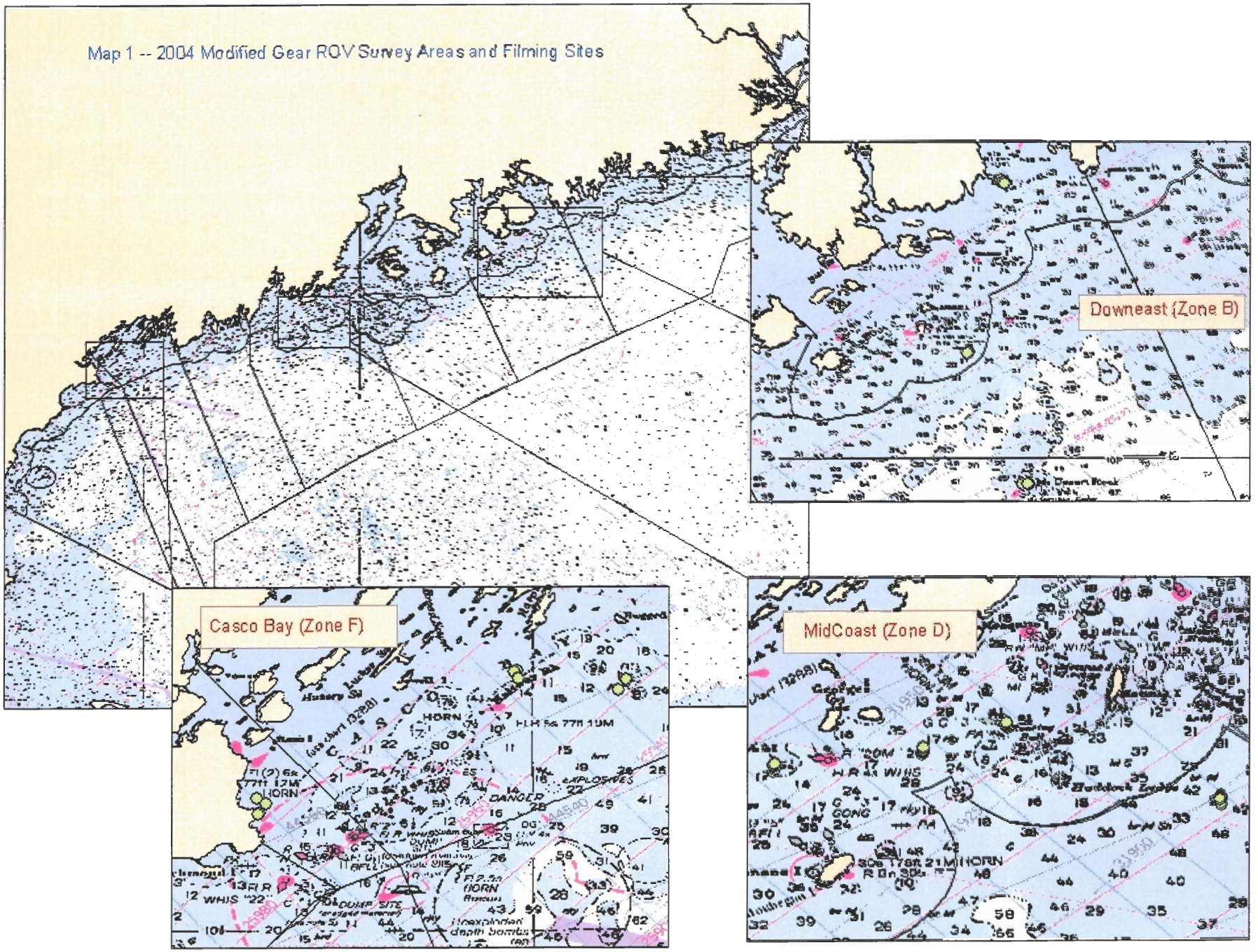
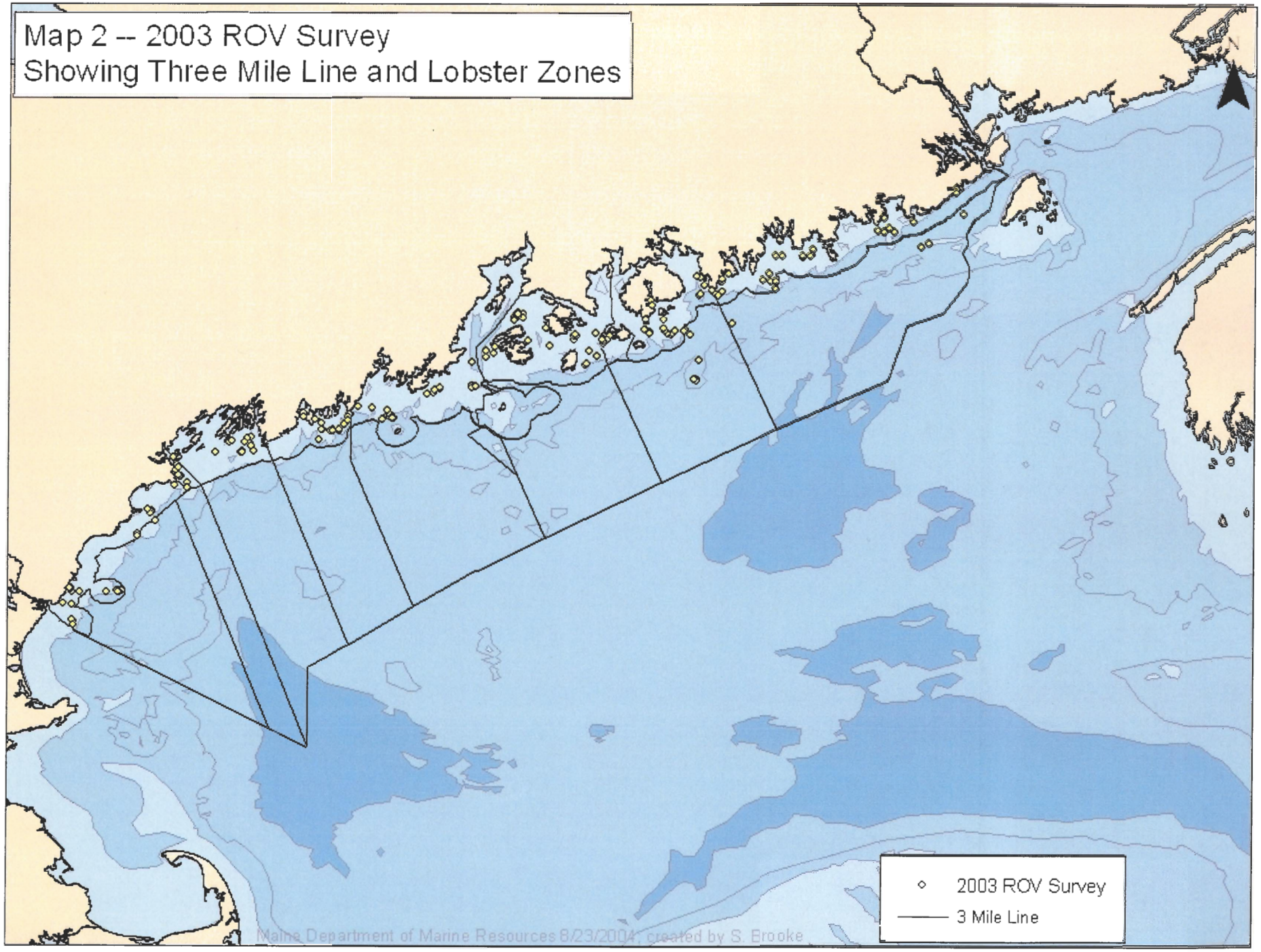

Average Arc Heights
Arc Height (in feet)
30
25
20
15
10
5
0
0 0 0 0
0 0
Pairs
Trawls
Polysteel
Lo Pro 1
Estapro
Quintas
Custom
Lo Pro 2
Rope Type

Table 4

1 FATHOM (FA) = 6 FEET (FT)

FATHOMS	=	FEET
1		**6**
2		12
3		18
4		24
5		30
6		36
7		42
8		48
9		54
10		60
11		66
12		72
13		78
14		84
15		**90**
16		96
17		102
18		108
19		114
20		**120**
21		126
22		132
23		138
24		144
25		150
26		156
27		162
28		168
29		174
30		180
31		186
32		192
33		198


Map 1 -- 2004 Modified Gear ROV Survey Areas and Filming Sites
Downeast (Zone B)
Casco Bay (Zone F)
MidCoast (Zone D)


Map 2 -- 2003 ROV Survey
Showing Three Mile Line and Lobster Zones
2003 ROV Survey
3 Mile Line
Maine Department of Marine Resources 8/23/2004, created by S. Brooke